

What is claimed is:

1. A process for metal deposition, comprising treating a substrate with a bismuth material and a sulfur material and metal plating the substrate.
2. The process of claim 1 wherein the substrate is treated with trivalent bismuth.
3. The process of claim 1 or 2 wherein the substrate is first treated with a bismuth material and then treated with a sulfur material.
4. The process of any one of claims 1 through 3 wherein the substrate is treated with a sulfide reagent.
5. The process of claim 4 wherein the sulfide reagent is an inorganic or organic sulfide.
6. The process of any one of claims 1 through 5 wherein the sulfide is a sulfur salt.
7. The process of any one of claims 1 through 6 wherein substrate is treated with a solution of the bismuth material.
8. The process of claim 7 wherein the bismuth solution is an aqueous solution having a bismuth ion concentration of from about 0.005 to about 0.3M.
9. The process of any one of claims 1 through 8 wherein the substrate is treated with a solution of the sulfur material.
10. The process of claim 9 wherein the sulfur solution is an aqueous sulfide solution.
11. The process of any one of claims 1 through 10 wherein the substrate is electrolytically plated with nickel.

12. The process of any one of claims 1 through 10 wherein the substrate is electrolytically plated with copper.

Sub A13 } 13. The process of any one of claims 1 through 10 wherein the substrate is electrolytically plated with gold.

14. The process of any one of claims 1 through 13 wherein the substrate is treated with an etchant prior to treatment with the bismuth material.

15. The process of any one of claims 1 through 14 wherein the substrate surface comprises a dielectric material. A

16. The process of any one of claims 1 through 15 wherein the substrate surface comprises an epoxy resin, ABS, or a polyetherimide.

17. The process of any one of claims 1 through 16 wherein the substrate is an electronic packaging substrate.

Sub A14 } 18. The process of any one of claims 1 through 16 wherein the metal plate provides a decorative or protective function.

19. The process of any one of claims 1 through 18 wherein the substrate is treated with water after treatment with the bismuth material and before treatment with the sulfide material.

20. An article of manufacture, comprising a substrate having a metal deposit thereof, the metal deposit provided by a process of any one of claims 1 through 19. A

21. An article of manufacture, comprising a substrate having an electrolytic metal deposit thereon, and a bismuth material underlying the metal deposit.
22. The article of claim 21, wherein sulfur further underlies the metal deposit.
23. The article of claim 21 or 22 wherein the metal is deposited over a dielectric layer.
24. The article of any one of claims 21 through 23 wherein the substrate is an electronic packaging substrate.
25. The article of any one of claims 21 through 23 wherein the metal plate provides a decorative or protective function.
26. The article of any one of claims 21 through 23 wherein the substrate is an electromagnetic shielding material.